Mechanical and Energy Engineering

The Benchwarmers

Abstract
The objective of this project is to be able to control the water temperature as it continuously flows through the closed system to within a ± 2
Fahrenheit of the target temperature for any given test. This will be accomplished using a PID controller and multiple temperature sensors/thermocouples located along the path of the system s flow to provide the feedback to the
PID controller. The system needs to be easy to maintain and clean, safe to use, take up as little space as possible on the manufacturing floor, and be as efficient as possible

Team members:
Robert Myer
Alejandro Rivas
Raul Salvador
Riley Walberg
Grant Wuensch

Sponsors
Capstone Metering Jim Williamson
Dr. Choi

Mechanical and Energy Engineering

Team FSW

Abstract
The bicycle is a popular choice for commuters around the world. However, many may experience terrain that makes pedaling difficult or weather that leaves them in need of showering once they reach their destination. The team has designed a product that can make the commute easier and quicker without drastically changing the bicycle or requiring the commuter to buy a new bicycle.

By using a motor rack that easily clamps to the seat post and a battery rack bolted to the frame, this design supplies power to the rear wheel via a chain connected to the motor and a modified rear sprocket. The system is powered by two LiFePO4 12v batteries connected in series.

Not only does this ease a commuter's workload, it will also appeal to newcomers to the bicycling world that have been reluctant to begin biking because of the sometimes strenuous nature of the activity.

Team members:
Colton Kadlecek
Zac Youngblood
Shuai Zhang
Sponsors
Dr. Shi
Acknowledgements:
Dr. Wasikoski, Dr. Shi, Erin Allice, Robbin Shull

COLLEGE OF ENGINEERING UNT

Mechanical and Energy Engineering

Smith

Abstract
Global appetite for energy grows at an unsustainable rate. Alternative energy sources are required to safely meet the escalation in a sustainable manner. This project investigates the possibility of supplementing standard photovoltaic (PV) cells with thermoelectric materials. Additionally, the panel features cooling aspects to increase its efficiency by reducing its operating temperature. The team has created a test stand that places a refrigerated box housing thermoelectric modules on the back of a pv panel. It records temperature data at key points to create a temperature profile and thermal circuit, voltage and current to track power, and incoming solar radiation. A total of 42 channels of simultaneous data are set to be logged. All data is used to calculate efficiency values. The stand is also modular, capable of being run as experiment platform on standard photovoltaics or just thermoelectrics. It includes 5 degree increments for locking both azimuth and tilt angles. The team is creating a basic lab manual with the intention of leaving the test stand intact for use in the undergraduate MEE labs and/or Alternative Energy courses.

Team members:
Leroy Ahwinahwi
Hamad Alomani
Jeremy Riggs
Robert P Smith

Sponsors
Dr. Xiaohua Li
Acknowledgements:
Aztec Renewable Energy located in Denton, TX donated a PV panel for this project.

Mechanical and Energy Engineering

Team Rocket

Abstract
UNT Team Rocket was given their project guidelines from NASA University Student Launch Initiative. Which had the teams create a single stage rocket that would be able to achieve 5280 ft height. Upon reaching apogee the team had to then bring down the rocket using dual deployment with a redundancy system in place to assure the safety of the rocket. The team also had to select one of three payloads to keep within the rocket during flight.

The team designed, analyzed, built, and tested their rocket throughout the various design phases. The team launched two subscale rockets, one at an 80% scale and the second at a 50% scale. Once the subscale was complete the full scale rocket was built and tested once with a full fragile protection payload. The rocket completed the teams objective of testing their full scale flight which proved that the rocket would be stable, protect its payload, and safely be recovered. Once the test flight was a success, the team qualified for the actual competition which was held during the first week of April.

Team members:
Jessica Hampton
Joel Thompson
Luis Gonzalez
Karen Lindsey Smith

Sponsors
Lockheed Martin Russell Blum
Dr. Wasikowski

Acknowledgements:
Dr. Wasikowski, Robbin Shull, Erin Allice, Natarsha Joseph-Hall, Lockheed Martin, Solidworks, Anida Technologies, and Dallas Area Rocket Society (DARS)

Mechanical and Energy Engineering

MEEN Green

Abstract
The inefficiency of solar panels is due to the heat generated during operation causing it to overheat. The excess heat goes unused making it lost energy. For our project, we are designing a system that will show the potential there is in capturing the heat from the solar panel and productively applying it somewhere else.
The application we re considering is applying the heat to heat water for domestic use. To accomplish this, we are designing a heat pump system using the solar panel with a cold plate as the evaporator and using a coil running through the water as the condenser. The temperature change in the water we produce will be representative of how effectively we re able to remove heat from the panel and apply it to the water. We will consider the heat output for the typical parameters of the 12 months of the year.

Team members:
Christian Stephens
Luis Ramirez
Roque Rivas
Juan Espinosa
Tyrone Thompson

Sponsors
CertainTeed Chris Fisher
Vish Prasad
Acknowledgements:
Mentor: Richard Roberts

Mechanical and Energy Engineering

Mayday Engineering

Abstract
Our project is to design and build a custom 3D printer, using servo motors, instead of steppers. The printer will be used in-house by Mayday Manufacturing for production support. The printer will have a large print volume, high resolution, and excellent repeatability.

Team members:
Tyler Chidester Ian Morrow
Clark Limbaugh Daniel Whitaker
Jamie Wood

Sponsors
Mayday Manufacturing Josh Lacko
Dr. Zhao

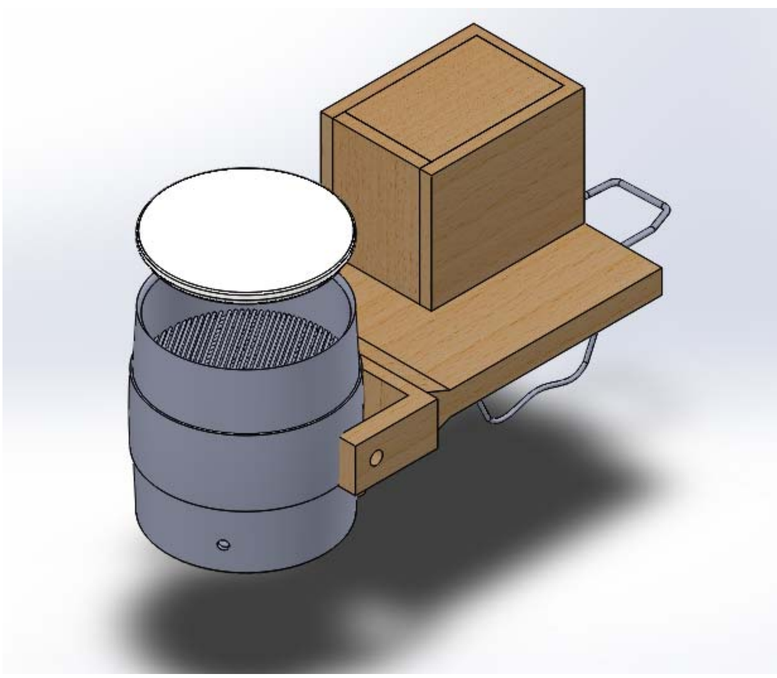
Acknowledgements:
Rick Pierson, Mark Wasikowski, Robbin Shull,Josh Lacko, Teknic, Inc, UNT College of Engineering, Erin Alice.

Mechanical and Energy Engineering

The Water Cycle

Abstract
The goal of this project is to construct a mechanically powered water sanitation system that fits onto a bicycle. This design is aimed at providing clean water solutions in settings where access to clean water is not readily available. Constructing a water filtration system on the bicycle will help give its users a means for transportation and filtration.
The process begins after water is collected into a container where the dirty water is stored. While the bike is stationary, the user will pedal the bike to power the peristaltic pump. The mechanical power will be transferred from the pedal to drive a shaft which will power the peristaltic pump. The peristaltic pump will then draw the dirty water, which will then be run through a set of filters, and stored in the water bags.

Team members:
Cassidi Mercereau
Kyle Croft
John Merkaje
Samuel Abraham
Roy Aguh
Sponsors
Dr. Kuruvilla John



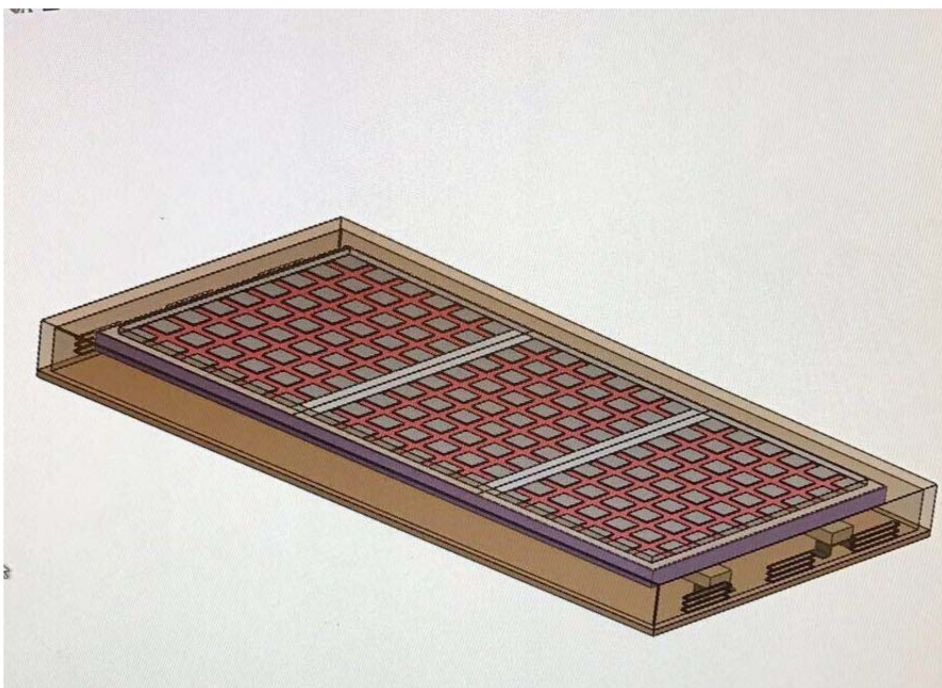
Mechanical and Energy Engineering

AMI team

Abstract
The concept of the Golf Cart Powered by Solar Energy Design is the use of solar panels that have the ability to produce electrical energy, which can be used to charge the batteries in the back of the golf cart. The process of charging the batteries is that the sunlight would hit the solar panels. Therefore, the charge controller will work to convert the sun s radiation into electrical energy that being delivered to the battery bank through covered wires. The main aspects of this golf cart are that, it will lower the cost of charging the batteries, so customers would save money on their electricity bills.

Team members:
Ahmed Almandhari
Ibrahim Alduways
Mansoor Al-busaidi

Sponsors
MEEN department



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Mechanical and Energy Engineering

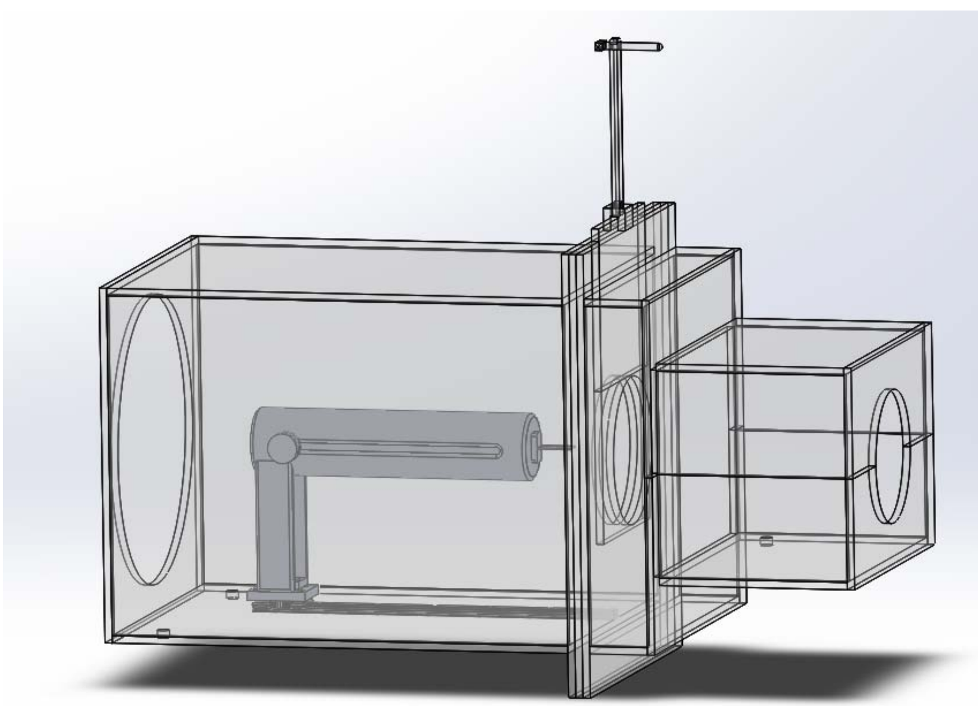
Team Zyvex

Abstract
Zyvex Labs is a nanotechnology company that creates nano-scale designs on silicon chips. After the nanochip is manufactured in their Ultra-High Vacuum (UHV) System, a technician removes it from the system and begins to take the chip off of the sample holder, then places the chip in the transportation container. From the time that the chip leaves the UHV to the time that it is placed in the transportation container (about 3 minutes) it is exposed to ambient air. The dust particles and pollen in the air are very large compared to the design on the chip so if even one particle lands on the chip, the chip could be potentially ruined. This a large issue because it wastes Zyvex's time and money. This project attempts to solve this problem by creating an acrylic glovebox satellite with an extendable arm in order to provide a mobile clean environment.

Team members:
Ryan Tharp
Eric Good
Nathaniel Goode
Gerson Perez-Rios
Joseph Andrew Grimm

Sponsors
Zyvex Labs Dr. James Owen
Dr. Sheila Williams

Acknowledgements:
We would like to thank Dr. James Owen and the employees of Zyvex Labs, Dr. Mark Wasikowski, and Dr. Sheila Williams for mentoring during this project.Their help and advice provided much assistance over the course of 2 semesters.



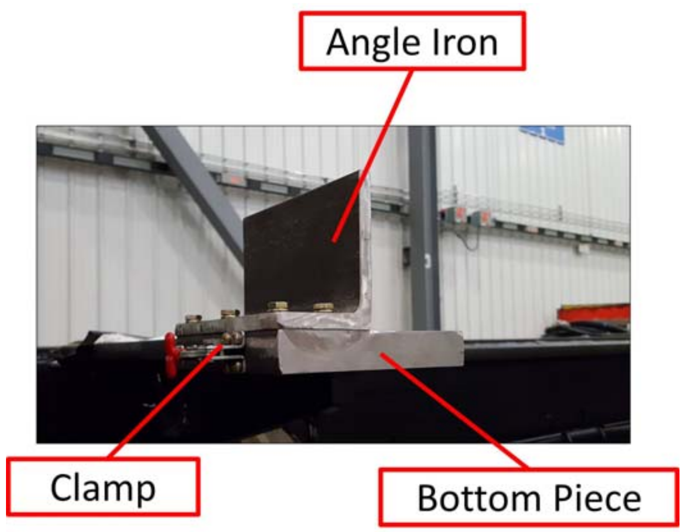
Mechanical and Energy Engineering

GE Aux Team

Abstract
This project is in partnership with General Electric (GE) Transportation, Incorporated. The major goal for this project is to increase the efficiency of the assembly process of locomotives at the GE Transportation plant in Fort Worth, Texas. Overall, GE Transportation wanted us to improve the locomotive assembly process in the Fort Worth facilities. GE Transportation would continuously observe placement issues with the auxiliary and main cabs onto the platform, and on many occasions, the main cab would fail to fit on the locomotive entirely and would be set aside for another attempt on a separate locomotive platform. This deeply cut into the time management aspect of the locomotive assembly process, and GE Transportation partnered with our team to come up with a solution to overcome this issue. The task given to our senior design team was to study the current assembly processes and use a new perspective to devise a data-driven solution that allows quick, easy, and repeatable cab sets during locomotive assemblies. We will build an alignment jig that mounts on the auxiliary cab s front needle beams, serving as a positioning guide based on blueprint drawings to ensure consistent cab placement.

Team members:
Mohaned Dewaidi
Christopher Dobbs
Stephen Ellis
Corey Rockefeller
Joseph Wyman
Sponsors
GE Transportation, Inc. Tim Mullett
Acknowledgements:
We would like to express our gratitude to the following individuals and companies who helped in the success of our senior design project:

Tim Mullett
Michael Neuenswander
Mark Tatum
James Mowdy
Mark Wasikowski
AFISCO Industrial, Inc.
Earl R. Waddell & Sons, Inc.
GE Transportation, Inc. and all GE team members



Mechanical and Energy Engineering

Furious 5

Abstract
Our project was to create a human powered vehicle to enter the ASME Human Powered Vehicle Challenge. Our goal was to create a vehicle that met the ASME qualifications while staying within a strict budget. Our design is a three-wheel recumbent style bike with two front wheels for steering and one rear wheel to drive the bike forward. The frame was created to hold a max rider weight of 300 pounds while also protecting the rider from a rollover accident. The designed roll bar meets ASME requirements for the Rollover Protection System (RPS). The roll bar can protect the rider from top impact load of 2670 Newtons, and a side impact load of 1330 Newtons.

Team members:
Ifeanyi Agolua
Majid Alatowi
Jerrell Cook
Obinna Nwaobia
Unwana Iwot

Sponsors
Acknowledgements:
Dr. Cherish Qualls
Dr. Ruth Pierson
Rick Pierson
Natarsha Joseph-Hall
Robbin Shull
Erin Allice
Affordable Welding Services

Mechanical and Energy Engineering

PolyFoam

Abstract

The use of gas to physically foam a polymer is a novel approach that eliminates environmentally harmful and carcinogenic foaming agents. In this project, a new pressure vessel was designed to physically foam polymer using compressed CO_2 gas. The chamber contains a cylinder 12 in length and 2.125 in diameter capable of operating at temperatures between -100 to 245 C and pressures of 1500 psi. Heating was accomplished via an internal cartridge heater installed within the chamber. A voltage controller is connected to and regulates the heater temperature via a thermocouple, while an external chilled water circulator circumscribes the chamber for cooling. PolyLactic Acid (PLA) foaming is conducted using a temperature of 100 C and pressure of 1000 psi, resulting in a factor of safety of 3.5 during operation. Under these conditions, PLA can reach optimum pore size in 10 minutes, with a post-operation cooling time of 16 minutes. The new design is 72 times more efficient than the current approach of using super-critical CO_2 at room temperature, and the resulting foamed PLA strands can be used as biodegradable sutures or implants capable of being infused with medication. Using alternative polymers or fibers within the chamber would also be applicable.

Team members:

Mariela Alvarez
Hans Roehrig
Lex Schindler
Aaron Sundquist

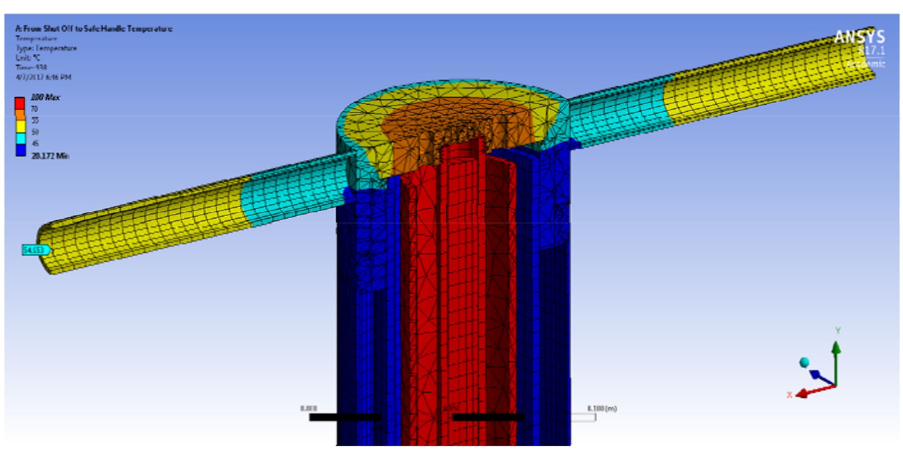
Sponsors

Society of Plastics Engineers

Dr. Nandika D'Souza

Acknowledgements:

Erin Alice | Administrative Specialist - Administration
Kayode Oluwabunmi | Graduate Student - Extrusion & Polymer Foaming Training
Rick Pierson | Lab Technician - Manufacturing & Machining Advice; Machining Labor
Hussain Rizvi | Graduate Student - Extrusion & Polymer Foaming Training
Robbin Shull | MEE Lab Manager - Manufacturing & Machining Advice



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Mechanical and Energy Engineering

Team Triumph

Abstract
Team Triumph is tasked to find a method to help with metal fabrication. Triumph is one of the largest if not the largest metal assembly fabricators for the Boeing 747 and the 767-the military version of the civilian aircraft. During a 2 semesters journey 6 students modeled and crafted a self driving robot to move in the x, y and z access. The objective is to answer as many questions Triumph had and in the process work effectively towards a goal.

Team members:
Sarah Bundy
Preston Stalter
Ryne Spears
Blake Stewart
Brandon Leney
Phai Thach
Sponsors
Don Surratt & Curtis Thompson Don Surratt & Curtis Thompson
Mark Wasikowski

Mechanical and Energy Engineering

Team ASME

Abstract
GE tasked our group with reducing variation and increase productivity in their Final Assembly process. The scope of the project entailed: identifying drivers of waste using root cause analysis of their Main & Auxiliary Cab set processes; creating changes to the process in building the locomotive; and designing tools that help Assembly Team members accomplish a successful cab set quicker with more consistency and higher accuracy. In the end the team developed multiple fixtures, or tools, to help improve quality of the locomotive, safety in the process, and productivity on the line.

Team members:
Jonathan Thibodeaux
Calum Fletcher
Adam Bonilla
Sonja Sorbye
Mohammed Abualraha
Sponsors
GE Timothy Mullett
Mark Wasikowski
Acknowledgements:
Timothy Mullett, GE Lean Central Leader, and project mentor
Sarah Duman, GE Manufacturing Engineer, and project support
Michael Neuenswander, GE Manufacturing Engineer, and project support

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Mechanical and Energy Engineering

UNT Torch Squad

Abstract
A Forney Corporation sponsored project in which a natural gas turbine emits gas to an integrated burner duct system where the duct burner will ignite the exhaust gas. The team was instructed to design a baffle that increases the velocity from 900 ft/min to 4000 ft/min without increasing back pressure by 0.5 water column. The team designed multiple baffles in SolidWorks and imported the designs into ANSYS for velocity and pressure profile analysis. After close examination, the team proceeded to build and test selected prototypes in a wind tunnel.

Team members:
Shannon Smith
Jordan Hollingsworth
Sofia Weir
Eric Tien

Sponsors
Forney Al Smith
Dr. Wasikowski

Acknowledgements:
Dr. Wasikowski
Robbin Shull,
Rick Pierson
Bobby Grimes
Al Smith

Mechanical and Energy Engineering

PDQ Printing

Abstract
PDQ printing is comprised of four Mechanical and Energy Engineering students with a passion for 3D printing. We worked closely with our sponsor PolyPrinter, to improve the extrusion rate of their line of 3D printers. We were asked to develop a hot end capable of extruding a 0.25mmx0.35mm path of ABS at 500 mm/s while not exceeding a 30% weight increase

Team members:
Robert Cline
Jacob Long
Brian Mcconnell
Caleb Tallakson

Sponsors
PolyPrinter Ed Kaufman
Dr. Zhao

Acknowledgements:
Special thanks to our industry sponsor Ed Kaufman, and to our factory sponsor Dr. Zhao

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Mechanical and Energy Engineering

Hoist Away

Abstract
The cable hoist is an electrically driven, lifting hoist that is utilized on jet bridges in commercial airports throughout the country. The purpose of the hoist is to raise and lower the industrial cables that are used to power various types of aircraft when these aircraft are in the terminals. The hoists are expected to lift cables that range from 300 to 600 pounds, depending on whether the hoist supports one or two cables. The goal of this project is to redesign the current cable hoist system designed by CCC Power. The current design has issues ranging from failure of parts to unsatisfactory cosmetics. The overall goal is to incorporate design changes that lead to improved reliability in the components as well as make the exterior of the cable hoist more aesthetically appealing long-term.

Team members:
Jacob Behning
Jonathan Garcia
Zachary Garner
Brian Hardy
Hannah Wilcox
Sponsors
CCC Power Jim Knight
Mark Wasikowski
Acknowledgements:
Thanks to Jim Knight, Jay Chenault, and Robbie Chenault at CCC Power for sponsoring this project and being attentive and helpful when we had questions.

Special thanks Wilson's Transmissions for allowing us to use their facilities for fabrication.

COLLEGE OF ENGINEERING UNT

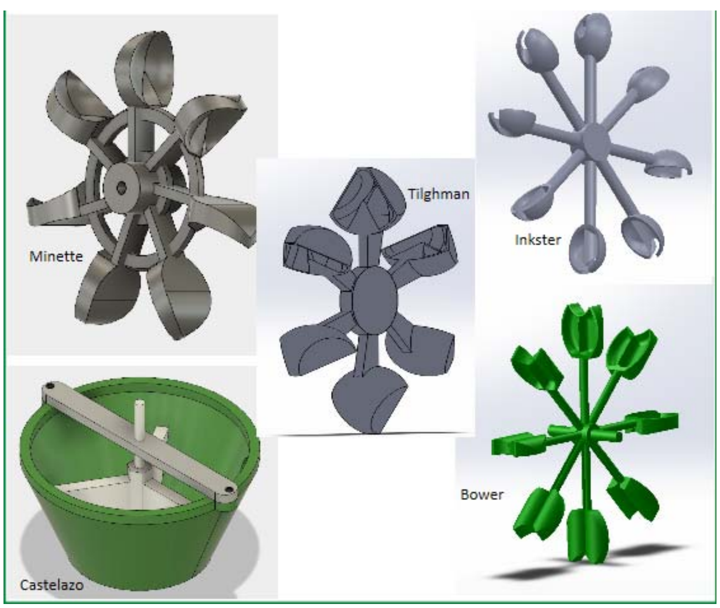
Mechanical and Energy Engineering

Killa-Watts

Abstract
The team wanted to create a hydro-electric turbine test-stand with a mount for interchangeable student designed turbine wheels. The stand would allow students to compare theoretical potential energy of a suspended water column to the actual output of a turbine system. Students would then be able to calculate system/turbine efficiency and theorize ways to improve the system. Using working principles of hydroelectric power plants, Pelton wheels, Francis Turbines, and other common turbines, this project will be created for long term use in the Mechanical and Energy Department. It will be durable, functional, and could be used in the MEEN Lab or as a hands-on demonstration for Alternative Energy Sources. The project will be used to educate the UNT Mechanical and Energy Engineering undergraduates in hydroelectric principles and applications as well as giving any future student the opportunity to create and test their own turbine.

Team members:
Dakota Bower
Xavier Castelazo
Garrett Inkster
Sarah Minette
Cody Tilghman

Sponsors
UNT MEEN Dept. N/A
Cherish Qualls
Acknowledgements:



COLLEGE OF ENGINEERING UNT

Mechanical and Energy Engineering

Team Carrier

Abstract

We designed a heating and cooling device to help control the temperature of a children's car carrier. We used thermoelectric cooling devices (TEC s) as the heating/cooling source in our design. TEC s create a temperature difference between two ceramic plates when a current is passed through them. Our design uses a box separating the cool side and the hot side of the TEC. Each side has a fan pushing air either out to the environment or into the carrier. We decided to use TEC s because they were overall the safest option that we found because they don t use any sort of refrigerants to cool the system, and they have no moving parts. Our main goal when coming up with this design was to keep children safe and comfortable.

Team members:

Ange Aluku
Samantha Brophy
William Edwards
Nathan Groover
Scott Howell

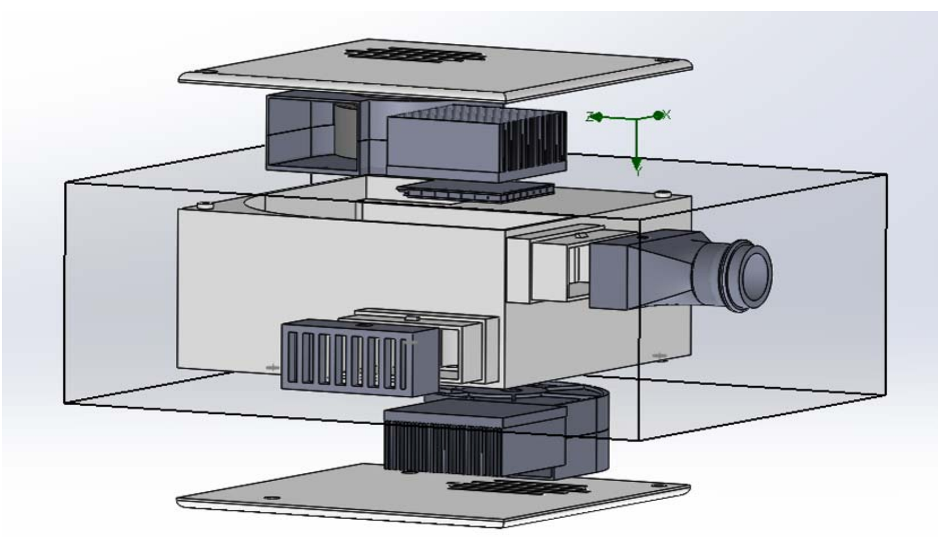
Sponsors

Marlow Industries

Dr. Choi

Acknowledgements:

The group would like to thank our faculty adviser Dr. Choi for all the knowledge and input he s given us to improve our original design, and also Dr. Wasikowski for challenging the group to find more efficient way in completing our final design. As well as Marlow Industries for donating the TEC s and a few other parts needed to complete the design as well as helping us with our initial design and information.



COLLEGE OF ENGINEERING UNT

Mechanical and Energy Engineering

Board Engineers

Abstract
The goal was to design an inexpensive motorized longboard option that could be fitted to any existing board, and have the capability to quickly disengage the motor for riding once the battery dies.

Team members:
Aubrey Kingman
Dylan St. John
David Bracewell
Yichun Cai
Mohammed Almarzooq

Sponsors

Acknowledgements:
Thanks to Dr Sheila Williams, our faculty adviser, fellow undergrad student Corey Stoll for advise on ESC's and general electronic advice early on, PhD student Richard Roberts for his assistance with MATLAB, the 3D printer, and general assistance with all things, Khaled Almahmoud, a TA who helped with 3D design and Fusion 360,TA Lee Smith who offered advice and inspiration, Yanliang Zhou and Yixin Gu from the EE department assisting with Arduino and all things electronic, Anton Yorzh, TA who assisted in choosing materials and offered advice throughout.

Mechanical and Energy Engineering

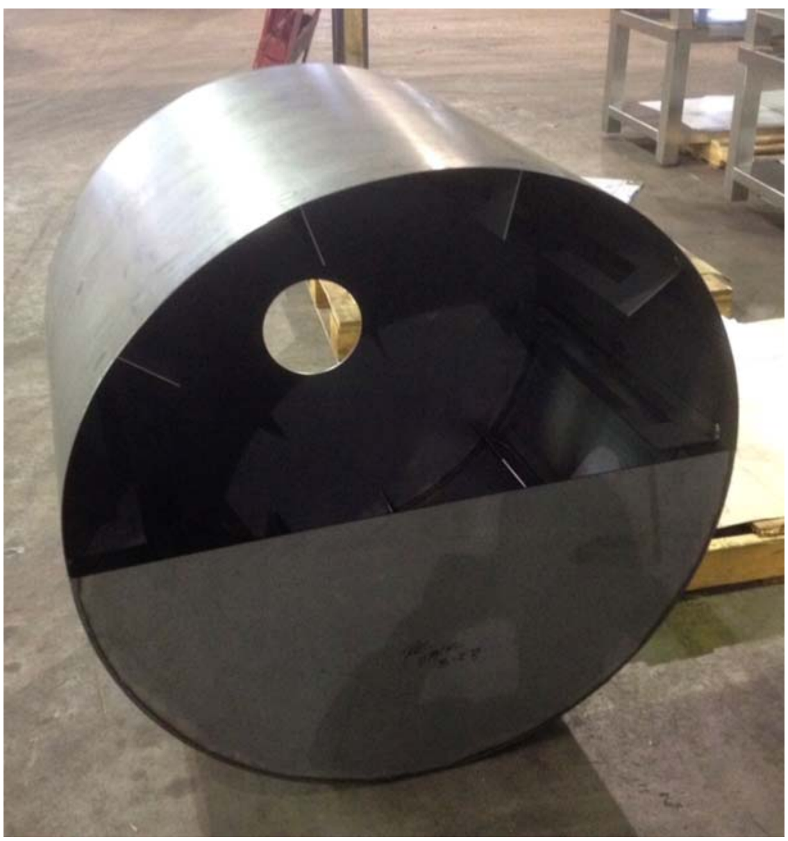
Team 5 Star

Abstract
Our design is a Drum Resin Mixer. It is designed to mix wood composite resin and to be used by students in Dr. Shi's lab at the University of North Texas.

Team members:
Christopher Miles
Eric Gilstrap II
Gerald Onyekonwu
Alina Meakin
Collins Ukpe-Chukwuka

Sponsors
Dr. Shi

Acknowledgements:
Thank you Dr. Shi and Lee for advising and aiding us in the design process. Thanks to Rick Pierson for helping us with fabrication and welding. Thanks to Dr. Cai for providing a VFD and other devices.



Mechanical and Energy Engineering

Designers

Abstract
The efficacy of a solar panel hinges on the necessary principle to keep the solar panel durable and maximally efficient. The Designers team s goal is to incorporate a green friendly cost-efficient PV cooling system that can be attached to past solar panel models and easily conformed to fit current designs. Our cooling system will eradicate current solar panels inability to provide maximum output while keeping the solar panel at a safe operating temperature.
Our efficient cooling system will allow the solar panel to increase output 20% as it will keep the solar panel running at a maximum power while keeping it at an optimum operating temperature. The PV cooling systems design is a misted pipe attachment that will be installed all around the solar panel setup. The pipe will be connected to a water pump that will provide the necessary mist. The mist will be pumped only when the thermometer gauge, a separate device connected directly to the solar panel, reads levels above a certain temperature range. This automatic system is environmentally friendly as it designed with green friendly materials and doesn t require an outside device that would waste energy needlessly. Overall, our PV cooling system will increase the durability of the panel while keeping it running at maximum efficiency all while running green friendly.

Team members:
Hesham Gazany
Abdulaziz Rasheed
Ahmed Alghamdi
Nasser Alsaeed
Sponsors
MEEN Department
Dr. Li

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